Name:

at1117paper: Complete the Square (v321)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 58 feet. Their combined area, found by adding the square's area and the rectangle's area, is 2075 square feet. What is the value of x?

Example's Solution

$$x^2 + 58x = 2075$$

To complete the square, add $\left(\frac{58}{2}\right)^2 = 841$ to both sides.

$$x^2 + 58x + 841 = 2916$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 29)^2 = 2916$$

Undo the squaring.

$$x + 29 = \pm\sqrt{2916}$$

$$x + 29 = \pm 54$$

Subtract 29 from both sides.

$$x = -29 \pm 54$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 25$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 58 feet. The total area, of the square and rectangle, is 1368 square feet. What is the value of x?

$$x^2 + 58x = 1368$$

$$x^2 + 58x + 841 = 2209$$

$$(x + 29)^2 = 2209$$

$$x + 29 = \pm 47$$

$$x = 18$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 44 feet. The total area, of the square and rectangle, is 1365 square feet. What is the value of x?

$$x^2 + 44x = 1365$$
$$x^2 + 44x + 484 = 1849$$
$$(x + 22)^2 = 1849$$
$$x + 22 = \pm 43$$
$$x = 21$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 40 feet. The total area, of the square and rectangle, is 441 square feet. What is the value of x?

$$x^2 + 40x = 441$$
$$x^2 + 40x + 400 = 841$$
$$(x + 20)^2 = 841$$
$$x + 20 = \pm 29$$
$$x = 9$$